

CLAIMS

1. An image processing apparatus operable to embed data into an image, said apparatus comprising

5 a combining processor operable to introduce said data into a transform domain representation providing a plurality of sub-bands divided by spatial frequency components, and, in combination with a transform processor, to combine said data with said image in one of

10 a transform domain form, said transform processor generating a transform domain form of said image, said data being combined with said image by said combining processor in said transform domain, and said transform processor generating a spatial domain representation of said combined image and data, or

15 a spatial domain form of said image, said transform processor generating a spatial domain representation of said transform domain data, said data being combined with said image by said combining processor in said spatial domain, wherein said data is introduced into at least one of said sub-bands in a scan direction, said at least one sub-band representing in said transform domain low spatial frequencies of said image in one direction and high spatial frequencies of said image in another direction, said scan direction being in the same direction in the sub-band as the direction of the low spatial frequencies of the image.

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2. An image processing apparatus as claimed in Claim 1, wherein said direction of said low spatial frequencies of said at least one sub-band and said another direction of said high spatial frequencies in said at least one sub-band are orthogonal with respect to each other.

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3. An image processing apparatus as claimed in Claim 1, comprising a modulator operable to modulate a Pseudo Random Symbol Stream with each of the data symbols to be embedded, wherein said combining processor is operable to introduce said modulated Pseudo Random Symbol Stream in said scan direction into
30 said transform domain representation.

4. An image processing apparatus as claimed in Claim 1, wherein said transform is the discrete wavelet transform, said data symbols in each of said sub-bands comprising wavelet coefficients, each symbol of said modulated data being added to the wavelet coefficients.

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5. An image processing apparatus as claimed in Claim 4, wherein said data is embedded in a first low vertical, high horizontal spatial frequencies sub-band, and a second high vertical, low horizontal spatial frequencies sub-band, said data being added to said first and second sub-bands in the vertical and the horizontal directions respectively.

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6. An image processing apparatus as claimed in Claim 5, wherein said data to be embedded in said image is distributed equally between said first and second sub-bands.

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7. An image processing apparatus as claimed in Claim 4, wherein said data to be embedded is a Universal Material Identifier (UMID).

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8. An image processing apparatus as claimed in Claim 1, comprising an error correction encoder operable to encode said data to form said data to be embedded.

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9. An image processing apparatus as claimed in Claim 1, wherein said transform processor is operable to transform said transform domain representation of said data to be embedded into the spatial domain, said combining processor being operable to receive said image in the spatial domain and to combine said image with said spatial domain representation of said embedded data.

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10. An image processing apparatus as claimed in Claim 1, wherein said transform processor is operable to receive said image in the spatial domain and to transform said image into the transform domain, and said combining processor is operable to combine said transform domain image with the transform domain

representation of said data to be embedded, and said transform domain processor is operable to form an inverse transform of said combined transform domain image and data into the spatial domain.

5 11. An image processing apparatus as claimed in Claim 1, wherein said image is a video image.

12. A method of embedding data in an image, said method comprising
introducing said data to be embedded into a transform domain representation
10 corresponding to a spatial domain form of said data, said transform domain representation providing a plurality of sub-bands divided by spatial frequency components,

combining said data with said image by either generating a transform domain form of said image, combining said data with said image in the transform domain, and
15 generating a spatial domain representation of said combined image and data, or generating a spatial domain representation of said transform domain data, and combining said data with said image in said spatial domain, wherein said introducing said data into at least one of said sub-bands, comprises

adding said data in a scan direction to at least one of said sub-bands
20 representing in said transform domain low spatial frequencies of said image in one direction and high spatial frequencies of said image in another direction, said scan direction being in the same direction in the sub-band as the direction of the low spatial frequencies of the image.

25 13. A signal representing an image in which data has been embedded by an image processing apparatus according to any Claim 1.

14. A computer program providing computer executable instructions, which when loaded on to a data processor configures said data processor to operate as
30 an image processing apparatus as claimed in Claim 1.

15. A computer program having computer executable instructions, which when loaded on to a data processor causes the data processor to perform the method according to Claim 12.

5 16. A computer program product having a computer readable medium having recorded thereon information signals representative of the computer program claimed in Claim 14.

10 17. A computer program product having a computer readable medium having recorded thereon information signals representative of the computer program claimed in Claim 15.

18. An apparatus for embedding data in an image, said apparatus comprising
15 means for introducing said data to be embedded into a transform domain representation corresponding to a spatial domain form of said data, said transform domain representation providing a plurality of sub-bands divided by spatial frequency components,

means for combining said data with said image by either generating a
20 transform domain form of said image, combining said data with said image in the transform domain, and generating a spatial domain representation of said combined image and data, or generating a spatial domain representation of said transform domain data, and combining said data with said image in said spatial domain, wherein said introducing said data into at least one of said sub-bands, comprises

25 means for adding said data in a scan direction to at least one of said sub-bands representing in said transform domain low spatial frequencies of said image in one direction and high spatial frequencies of said image in another direction, said scan direction being in the same direction in the sub-band as the direction of the low spatial frequencies of the image.

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